

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7,415,320 B2  
APPLICATION NO. : 10/506460  
DATED : August 19, 2008  
INVENTOR(S) : Jannis Moutsokapas

8  
Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 18:

Line 4, Insert missing Claims 32-65

--32. The method of claim 1, wherein the method of unloading the transport vehicle comprises:

- a) identifying the transport vehicle and the container being unloaded and transferring the data generated in this way to the logistical management DP system,
- b) providing a calibrated camera system, detecting defined identification points of the container with said camera system and transferring coordinates of the identification points to the logistical management DP system,
- c) determining with the logistical management DP system, from the identification points, the fastener and position coordinate of the container,
- d) driving the stacker crane under computer control above the container, above the position coordinate, while the position coordinate is described by the vertical position of the upper edge of the identification points of the container and by the point of intersection of the diagonals of the identification points of the container, which describes the absolute target position of the load suspension device,
- e) providing a calibrated camera system arranged on the trolley of the stacker crane, detecting the fastener of the loading platform of the container and selectively moving the load suspension device so that the fastener of the load suspension device of the stacker crane stands above the coordinated fastener of the container,
- f) bringing the load suspension means up to the container such that the fastener of the load suspension means and the fastener of the container mate together.

33. Method according to claim 32, wherein the transport vehicle or the container being unloaded is identified by means of a camera system.

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7,415,320 B2  
APPLICATION NO. : 10/506460  
DATED : August 19, 2008  
INVENTOR(S) : Jannis Moutsokapas

8  
Page 2 of 2

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

34. Method according to claim 33, wherein said detecting the coordinates of the identification points of the loading platform or the identification points of the container comprises providing a user-defined interface on a monitor screen of the logistical management DP system, and selecting by an operator of the identification points of the loading platform or the identification points of the container with a marking mechanism on the user-defined interface.

35. Method according to claim 34, including automatically detecting the coordinates of the identification points of the loading platform or the identification points of the container by a computer system and transferring the coordinates to the logistical management DP system.

36. Method according to claim 35, wherein said automatically detecting of the coordinates of the loading platform of the transport vehicle occurs in its loading and unloading zone and that of the coordinates of the loading platform of the container occurs in its loading and unloading zone.

37. Method according to claim 35, wherein the automatically detecting of the coordinates of the loading platform of the transport vehicle or the coordinates of the container occurs in the identification zone.

38. Method according to claim 37, wherein the vertical position of the loading platform and the point of intersection of the diagonals of the identification points of the loading platform or the vertical position of the upper edge of the identification points of the container and the point of intersection of the diagonals of the identification points of the container describe the relative target position of the container.

39. Method according to claim 38, wherein the position coordinate is described by the absolute target position of the container or of the load suspension device, which is composed of the coordinates of the transport vehicle located in the parking position as detected by means of a camera and the relative target position of the container or of the load suspension device.

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7,415,320 B2  
APPLICATION NO. : 10/506460  
DATED : August 19, 2008  
INVENTOR(S) : Jannis Moutsokapas

8  
Page 3 of 8

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

**40.** Method according to claim 39, including moving the stacker crane into reach of the loading platform or of the container in such a way that the point of intersection of the diagonals of the fastener of the container or the load suspension device stands plumb above the point of intersection of the diagonals of the fastener of the loading platform or the container.

**41.** Method according to claim 40, including providing a second user-defined interface, said second user defined interface having four quadrants, each representing a pair of fasteners, and each pair consists of one fastener of the loading platform or of the container, projected by an image of the camera system, and of the coordinated fastener of the container or the load suspension device, projected by a superimposing of a computer-calculated contour of the container or of the load suspension means and of the fastener of the container or of the load suspension means onto the image.

**42.** Method according to claim 41, including determining any deviation in position of the container being loaded from the position of the loading platform or the position of the load suspension device from the position of the container being unloaded in the logistical management DP system for a fine-tuned positioning, by providing the second user-defined interface of logistical management with a second marking mechanism, wherein the operator selects at least one identification point of the loading platform or of the container with said second marking mechanism.

**43.** Method according to claim 42, including providing a fine positioning computer system and automatically recognizing any deviation in position of the container being loaded from the position of the loading platform or in the position of the load suspension device from the position of the container being unloaded with said fine positioning computer system.

**44.** Method according to claim 43, wherein a deviation in position of the container being loaded from the position of the loading platform of the container or in the position of the load suspension device from the container being unloaded, the load suspension device is rotated so that the fastener of the container stands plumb above the fastener of the loading platform, or the fastener of the load suspension device stands plumb above the fastener of the container.

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7,415,320 B2  
APPLICATION NO. : 10/506460  
DATED : August 19, 2008  
INVENTOR(S) : Jannis Moutsokapas

3  
Page 4 of 4

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

45. Method according to claim 44, including setting down and releasing of the container from the load suspension device or the setting down of the load suspension device of the stacker crane onto the container by the operator until the fasteners mate with each other.

46. Method according to claim 45, including adjusting the position of a stacker crane in a container storage space, said adjusting the position comprising providing a camera system having at least one calibrated camera fastened on the trolley of the stacker crane for detection of the position of containers being handled, with an absolute length measuring system to detect the position of the stacker crane, positioning the stacker crane travels above a reference point arranged at any given position within the container yard, so that said at least one calibrated camera of the camera system detects the reference point, and comparing the position of the reference point with the memorized position of the reference point with the logical management DP system and determining an offset when a deviation exists.

47. Method according to claim 46, characterized in that the container yard has several reference points, which can be detected by the cameras of the stacker crane.

48. Method according to claim 45 for adjusting the position of the at least one calibrated camera, which is arranged on the stacker crane including defining an absolute length measuring system for detecting the position of the stacker crane, characterized in that the container yard has a super-reference point and said at least one calibrated camera is arranged on the stacker crane that can be adjusted relative to it by means of the super-reference point.

49. Method according to claim 4, wherein the automatically detecting of the coordinates of the loading platform of the transport vehicle or the coordinates of the container occurs in the identification zone.

50. Method according to claim 1, wherein the automatically detecting of the coordinates of the loading platform of the transport vehicle or the coordinates of the container occurs in the identification zone.

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7,415,320 B2  
APPLICATION NO. : 10/506460  
DATED : August 19, 2008  
INVENTOR(S) : Jannis Moutsokapas

3  
Page 5 of 5

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

51. Method according to claim 32, wherein said detecting the coordinates of the identification points of the loading platform or the identification points of the container comprises providing a user-defined interface on a monitor screen of the logistical management DP system, and selecting by an operator of the identification points of the loading platform or the identification points of the container with a marking mechanism on the user-defined interface.

52. Method according to claim 32, including automatically detecting the coordinates of the identification points of the loading platform or the identification points of the container by a computer system and transferring the coordinates to the logistical management DP system.

53. Method according to claim 32, wherein said automatically detecting of the coordinates of the loading platform of the transport vehicle occurs in its loading and unloading zone and that of the coordinates of the loading platform of the container occurs in its loading and unloading zone.

54. Method according to claim 32, wherein the automatically detecting of the coordinates of the loading platform of the transport vehicle or the coordinates of the container occurs in the identification zone.

55. Method according to claim 32, wherein the vertical position of the loading platform and the point of intersection of the diagonals of the identification points of the loading platform or the vertical position of the upper edge of the identification points of the container and the point of intersection of the diagonals of the identification points of the container describe the relative target position of the container.

56. Method according to claim 32, wherein the position coordinate is described by the absolute target position of the container or of the load suspension device, which is composed of the coordinates of the transport vehicle located in the parking position as detected by means of a camera and the relative target position of the container or of the load suspension device.

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7,415,320 B2  
APPLICATION NO. : 10/506460  
DATED : August 19, 2008  
INVENTOR(S) : Jannis Moutsokapas

8  
Page 6 of 8

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

57. Method according to claim 32, including moving the stacker crane into reach of the loading platform or of the container in such a way that the point of intersection of the diagonals of the fastener of the container or the load suspension device stands plumb above the point of intersection of the diagonals of the fastener of the loading platform or the container.

58. Method according to claim 32, including providing a second user-defined interface, said second user defined interface having four quadrants, each representing a pair of fasteners, and each pair consists of one fastener of the loading platform or of the container, projected by an image of the camera system, and of the coordinated fastener of the container or the load suspension device, projected by a superimposing of a computer-calculated contour of the container or of the load suspension means and of the fastener of the container or of the load suspension means onto the image.

59. Method according to claim 32, including determining any deviation in position of the container being loaded from the position of the loading platform or the position of the load suspension device from the position of the container being unloaded in the logistical management DP system for a fine-tuned positioning, by providing the second user-defined interface of logistical management with a second marking mechanism, wherein the operator selects at least one identification point of the loading platform or of the container with said second marking mechanism.

60. Method according to claim 32, including providing a fine positioning computer system and automatically recognizing any deviation in position of the container being loaded from the position of the loading platform or in the position of the load suspension device from the position of the container being unloaded with said fine positioning computer system.

61. Method according to claim 32, wherein a deviation in position of the container being loaded from the position of the loading platform of the container or in the position of the load suspension device from the container being unloaded, the load suspension device is rotated so that the fastener of the container stands plumb above the fastener of the loading platform, or the fastener of the load suspension device stands plumb above the fastener of the container.

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7,415,320 B2  
APPLICATION NO. : 10/506460  
DATED : August 19, 2008  
INVENTOR(S) : Jannis Moutsokapas

8  
Page 7 of 8

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:





62. Method according to claim 32, including setting down and releasing of the container from the load suspension device or the setting down of the load suspension device of the stacker crane onto the container by the operator until the fasteners mate with each other.

63. Method according to claim 32, including adjusting the position of a stacker crane in a container storage space, said adjusting the position comprising providing a camera system having at least one calibrated camera fastened on the trolley of the stacker crane for detection of the position of containers being handled, with an absolute length measuring system to detect the position of the stacker crane, positioning the stacker crane travels above a reference point arranged at any given position within the container yard, so that said at least one calibrated camera of the camera system detects the reference point, and comparing the position of the reference point with the memorized position of the reference point with the logical management DP system and determining an offset when a deviation exists.

64. Method according to claim 63, characterized in that the container yard has several reference points, which can be detected by the cameras of the stacker crane.

65. Method according to claim 32 for adjusting the position of the at least one calibrated camera, which is arranged on the stacker crane including defining an absolute length measuring system for detecting the position of the stacker crane, characterized in that the container yard has a super-reference point and said at least one calibrated camera is arranged on the stacker crane that can be adjusted relative to it by means of the super-reference point.--

2  
This certificate supersedes certificate of correction  
issued April 7, 2009.





US007415320B2

(12) **United States Patent**  
Moutsokapas

(10) Patent No.: **US 7,415,320 B2**

(45) Date of Patent: **Aug. 19, 2008**

(54) **OPTICAL DEVICE FOR THE AUTOMATIC  
LOADING AND UNLOADING OF  
CONTAINERS ONTO VEHICLES**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

5,392,935 A *	2/1995	Kazama et al.	212/278
5,920,480 A *	7/1999	Nakamura et al.	700/114
6,052,627 A *	4/2000	Nakamura	700/182
7,165,929 B2 *	1/2007	Janes et al.	414/722

\* cited by examiner

(75) Inventor: **Jannis Moutsokapas, Monheim (DE)**

(73) Assignee: **Gottwald Port-Technology GmbH,  
Dusseldorf (DE)**

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 179 days.

(21) Appl. No.: **10/506,460**

(22) PCT Filed: **Mar. 13, 2003**

(86) PCT No.: **PCT/EP03/02575**

§ 371 (c)(1),  
(2), (4) Date: **Feb. 28, 2005**

(87) PCT Pub. No.: **WO03/078292**

PCT Pub. Date: **Sep. 25, 2003**

(65) **Prior Publication Data**

US 2005/0192702 A1 Sep. 1, 2005

(30) **Foreign Application Priority Data**

Mar. 15, 2002 (DE) ..... 102 12 590

(51) Int. Cl.  
**G06F 7/00** (2006.01)

(52) U.S. Cl. .... 700/213

(58) Field of Classification Search ..... 700/213  
See application file for complete search history.

*Primary Examiner*—Gene O. Crawford  
*Assistant Examiner*—Ramya G Prakasam  
(74) *Attorney, Agent, or Firm*—Van Dyke, Gardner, Linn & Burkhardt, LLP

(57) **ABSTRACT**

The invention relates to an automatic method for increasing the throughput of a container reloading point or a container storage space and for reducing the loading and unloading time for a container transport vehicle. According to said method, after the identification of a container transport vehicle, the loading platform of the transport vehicle that has been parked in the parking area of the container storage space is measured. The position co-ordinates of the loading platform are determined by a data processing system. The container to be loaded is then automatically positioned by means of a crane, using the position co-ordinates of the loading platform. To align the container exactly in relation to the loading platform, the latter is measured again and any deviation in relation to the position of the container thus obtained is used for said exact alignment. The container is deposited on the platform automatically. The unloading of a container transport vehicle involves practically identical steps.

**65 Claims, 14 Drawing Sheets**

